Before the

Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Kyma Medical Technologies Ltd	)	
Waiver of Part 15 of the Commission's Rules	)	ET Docket No. 15-119
Applicable to Ultra-Wideband Devices	)	

Reply Comments of Kyma Medical Technologies Ltd

Kyma Medical Technologies Ltd ("Kyma"), through its counsel, hereby submits these Reply Comments in response to the limited issues raised by commenters in the above-captioned proceeding ("Waiver Request"). Kyma is seeking a waiver of the Commission's ultra-wideband ("UWB") rules and measurement procedures to permit the marketing and operation of its unique UWB medical imaging system known as uCor 3.0 ("uCor Device" or "uCor"). Three commenters responded to the Waiver Request. Two of the commenters, Robert Bosch LLC ("Bosch") and the National Public Safety Telecommunications Council ("NPSTC"), support the Waiver Request while a third commenter, the GPS Innovation Alliance ("GPSIA"), does not oppose the Waiver Request but seeks additional information about the uCor that could, in GPSIA's view, potentially require certain conditions being placed on its use. These Reply Comments will clarify certain misunderstandings about the uCor Device and will address the erroneous and inaccurate statements or assumptions about the uCor's operations as expressed by some of the commenters.

Bosch Comments. Bosch fully supports the Waiver Request and asks the Commission to apply a practical interpretation to the Section 15.503(d) definition of "minimum bandwidth" for UWB technologies, in general. Kyma supports Bosch's request for such an interpretation of Section 15.503(d); however, this Waiver Request should in no way be delayed by the Commission's consideration of this issue more broadly. If additional input is needed or consultations with third parties required, the Commission should address the matter in a separate proceeding.

NPSTC Comments. NPSTC generally supports the Waiver Request and repeatedly indicates that the potential risk of interference from uCor Device operations would be minimal.[1] For example, NPSTC states that "[b]ased on the technical analysis [by NPSTC's spectrum engineer], it believes the Kyma device would present a minimal risk of interference to public safety communications in the 700 MHz and 800 MHz bands."[2] In addition, based on NPSTC's assumption that the uCor Device will operate with "slightly less than 1 second of transmission within a given 25 MHz sub-band a few times a day,"[3] NPSTC believes that an interfering signal with these characteristics would most likely be "imperceptible from a momentary RF fade, which occurs naturally."[4] As a point of clarification, however, NPSTC's statement that the output of the uCor Device will be slightly less than 1 second per sub-band a few times a day is not technically correct; the actual output will be ***less than 0.3 seconds*** per sub-band a few times a day. More specifically, Kyma uses a frame rate of 50 fps (*i.e.,* every frame takes 20 ms to

[1] NPSTC Comments at pp. 1 and 4-5.
[2] *Id.* at 4.
[3] *Id.* at 5.
[4] *Id.*

complete), such that a transmission of one minute duration with a dwell time of 100 us will produce a total transmission time per sub-band (50 fps x 60 sec x 100 us) of 0.3 seconds.

Thus, the possibility that an interfering signal would be perceptible "from a momentary RF fade" is even more remote than NPSTC had assumed. This should also address NPSTC's other concern that uCor Devices might operate on a more frequent schedule (though Kyma does not anticipate patients using the device more than 6-8 times per day) or that multiple devices might operate in close proximity to each other and combine emissions to create interference to other spectrum users.

The probability of multiple devices operating at the same exact time and in the same sub-band (*i.e.,* "unintentional synchronization") is extremely remote. For example, assume three uCor Devices are operating in a nursing home and located within 1 meter of an Emergency Medical Service responder. Due to a rapid signal fall off ($1/R^2$) and the remote likelihood of any synchronized transmissions, the combined power from these devices becomes negligible. Per any given sub-band, there will be a total interference time of 0.9 seconds over 1 minute (0.3 seconds total transmission time multiplied by three devices), spread randomly in short bursts of 100 us of dwell time each. This is comparable to the "slightly less than one second" of transmission time per sub-band for a single device, for which NPSTC concluded there were no interference concerns. Accordingly, it would appear that multiple devices operating in close proximity present a minimal risk of interference to other spectrum users.

GPSIA Comments. GPSIA raises various technical concerns which are restated below in italics, followed by Kyma's response.

1. *"Kyma should clarify whether the uCor transmitter would still comply with the requirements of FCC Rule Section 15.513(f) if bandwidth resolution had been appropriately scaled under FCC Rule Section 15.521(g). Kyma should also clarify why the Waiver does not separately seek relief from FCC Rule Section 15.521(g) and clarify the bandwidth of the uCor Device transmitter's signal, which appears far narrower than signals intended for operation under UWB rules."*[5]

Kyma does not require a waiver of Section 15.521(g). Preliminary test data in support of the Waiver Request were only meant to provide an initial estimate of the power levels. During certification testing for the uCor Device, the resolution bandwidth will be properly scaled in accordance with the rule and will demonstrate compliance with Section 15.513(f). As for GPSIA's request that Kyma "clarify the bandwidth of the uCor Device transmitter's signal, which appears far narrower than signals intended for operation under UWB rules," we remind GPSIA that the Waiver Request seeks a waiver of the Section 15.503(d) definition of UWB based on the Commission's determination in the 3d Radar Order that a fast stepping transmitter does not have to adhere to the "at any point in time" requirement provided it operates over a 500 MHz bandwidth during an ordinary transmission cycle.[6]

2. *"In particular, the Petition does not specify transmitter output power, specify how much power is radiated during normal operations, provide assumptions regarding the fraction of the transmitter output radiated into free space, provide assumptions about patient body absorption, or provide an explanation of the type of radiating element used. Without these basic transmitter parameters and propagation assumptions, the Commission cannot assess the interference threat presented by the uCor Device Transmitter."*[7]

The Commission will have all the transmitter parameters and propagation assumptions necessary to assess the interference threat presented by the uCor Device during the certification process.

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[5] GPSIA Comments at p. 5.

[6] *See In the Matter of Curtiss-Wright Controls Inc. Request for Waiver of Part 15 of the Commission's Rules Applicable to Ultra-Wideband Devices,* ET Docket No. 10-167, Order, 27 FCC Rcd 00234 (2012) ("*3d-Radar Order*").

[7] GPSIA Comments at p. 6.

Indeed, the Commission has already approved a customized test procedure for a prior version of the uCor Device.[8] We note that the initial testing of the uCor Device involved attaching the device to a dedicated jig comprised of an acceptable phantom and a body tissue mimicking fluid. The Commission determined that this would be the best method of determining the device's interference potential as opposed to estimating it from various antenna parameters. Thus, there is no need under the Commission's rules to identify the basic transmitter parameters and propagation assumptions to secure the requested rule waivers.

3. *Confirm that the calculated dwell times in Exhibit 1.0 [below] are correct.*

Exhibit 1.0

	Per Sweep (10 msec); Dwell per 25MHz range: 100 usec (max) 28 usec (min)	*Per Observation (60 sec)*	*Per Day = obs *8*
Time in RNSS Band, L1 1559-1610 MHz	*300 usec (max) 84 usec (min)*	*1.94 sec*	*15.5 sec*
Time in RNSS Band, L2 1217-1257 MHz	*200 usec (max) 56 usec (min)*	*1.52 sec*	*12.2 sec*
Time in RNSS Band, L5 1164-1214 MHz	*200 usec (max) 56 usec (min)*	*1.90 sec*	*15.2 sec*
Time in RNSS Band, all combined	*700 usec (max) 196 usec (min)*	*5.37 sec*	*43 sec*

GPSIA included the above chart in its Comments as Exhibit 1.0, and asked Kyma to confirm the accuracy of the information. However, there are a number of incorrect assumptions in the chart, including the following: (i) L1 contains only 2 sub-bands, not 3 (*i.e.*, therefore, the reference in the second column should be "200 us (max)," not "300 usec (max)"); (ii) the Sweep rate (Frame rate) is 20 msec, not 10 msec; and (iii) the "Per observation (60 seconds)" calculation should be calculated as follows: (Per SweepTime) x (Frame Rate) x(Observation Duration). For example,

[8] *See* FCC ID: 2ABHFUCOR100.

the "Per Observation" calculations for the L2 band would be: (a) Maximum: 200us x 50Hz x 60 sec = 0.6 sec; and (b) Minimum: 56us x 50Hz x 60 sec = 0.27 sec. Accordingly, all of the calculations in the "Per Observation" and "Per Day" columns in the GPSIA chart are incorrect.

Subject to the foregoing corrections, Kyma can guarantee the dwell times that will be experienced by the uCor Device.

4. *"The Commission should consider whether there are available technical means to ensure the uCor Device radiates solely downward into patients in horizontal positions. In addition, such technical means should be considered to ensure that the uCor Device only transmits when in full contact with a patient's skin".*[9]

The uCor Device uses two safety mechanisms designed to cease operations when the device is no longer in contact with the patient. First, a mechanical circuit is opened if the device is outside of the patch that is attached to the patient. When this event is detected, transmission is aborted. Second, the RF signal level is checked per frame versus a threshold setting. If the device is activated in free space, the signal level drops and the transmission is aborted. However, the device is not designed to abort transmission based on the positioning of the patient (*e.g.*, reclining, standing, etc.). Emissions from the uCor are attenuated by the fact that they are directed into the human body and are going to be essentially the same the patient is lying down or standing up (or doing somersaults) at the time of operation.

5. *"The Commission should expressly prohibit the use of the uCor Devices UWB functionality for non-measurement (i.e., communications) purposes."*[10]

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[9] GPSIA Comments at p. 7.
[10] *Id.*

Kyma does not intend the uCor Device to be used for non-measurement communications purposes. The uCor Device is specifically designed for the purpose set forth in the Waiver Request.

6. *"Given the 'pocket-sized' nature of the uCor Device, an appropriate safety mechanism should be considered to ensure transmitters cannot operate while in transit (e.g., while medical staff or patients are traveling by commercial air). Requiring uCor Device's to be tethered through an 802.11, Bluetooth or other conventional wireless link to a permanent, fixed device within a medical facility would mitigate this problem. If the tethered connection fails, the uCor Device would be prohibited from transmitting."*[11]

Patients will be advised in the user manual to remove the device when boarding an aircraft. The uCore Device is designed to be used in both medical and non-medical environments so "tethering" the device to a wireless link would be both impractical and potentially unsafe for patients.

7. *"Any emissions below 960 MHz from medical imaging systems are subject to FCC Rule Section 15.209. That rule expressly prohibits intentional emissions between 470 MHz and 806 MHz. Intentional emissions contemplated under the current waiver clearly fall within 470-806 MHz. Accordingly, Kyma should separately seek and justify a waiver of this rule."*[12]

The uCor does not require a waiver of Section 15.209. GPSIA is misreading the relevant regulations and misinterpreting the applicability of Section 15.209 to UWB devices, including UWB medical imaging systems under Section 15.513. GPSIA improperly conflates the "emission levels" in Section 15.209 (which must be satisfied pursuant to Section 15.513) with the frequency band restrictions in Section 15.209 (which are not a limitation on operation under

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[11] *Id.*
[12] *Id.* at p. 5.

Section 15.513). Indeed, the underlying purpose of the UWB rules is to permit devices to operate despite the restricted bands set forth in Sections 15.205 and 15.209.

The plain language of Section 15.513(d) requires a UWB medical imaging system to comply with the emission levels set forth in Section 15.209. Specifically, Section 15.513(d) states that "[t]he radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall ***not exceed the emission levels*** in §15.209."[13] This language is also found in the technical rules governing other UWB device operations.[14]

There is no indication in Section 15.513 (or any other section of Subpart F of Part 15) that an UWB device, is subject to the frequency band restrictions (as opposed to "emission levels") below 960 MHz which are set forth in a footnote within Section 15.209. This footnote states that "fundamental emissions … shall not be located in the frequency bands 54 – 72 MHz, 76 – 88 MHz, 174 – 216 MHz or 470 – 806 MHz." However, the footnote recognizes that various types of Part 15 devices are not covered by this restriction by providing an exception which states that operations within these frequency bands ***are*** "permitted under other sections of this part" which would include the UWB rules set forth in Subpart F of Part 15.

The 2002 UWB Order[15] adopting the UWB rules makes clear that the Commission had no intention of prohibiting UWB device operations in the 470 – 806 MHz band (or any other restricted band listed in Sections 15.205 or 15.209). First, there is no mention of any

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[13] 47 C.F.R §15.513(d).
[14] *See* 47 C.F.R. §15.509(d) (governing UWB ground penetrating radars and UWB wall imaging systems), 47 C.F.R. §15.511(c) (governing UWB surveillance systems) and 47 C.F.R. §15.515(d) (governing UWB vehicular radar systems).
[15] *In the Matter of Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, First Report and Order,* 17 FCC Rcd 7435 at ¶ 1 (2002) ("*2002 UWB Order*").

requirement that any UWB device observe any of the restricted bands that apply to general Part 15 intentional radiators. If the Commission intended to prohibit UWB operations in a specific block of spectrum it would have unequivocally stated as much. Second, the Commission clearly expected UWB operations below 960 MHz when it observed that "GPRs **must be operated below 960 MHZ** or in the frequency band 3.1 – 10.6 GHz. (emphasis added)"[16] If the Commission intended to restrict GRP operations in 42.5% of the spectrum below 960 MHz, it would have had to clearly articulate a limitation this material.[17]

Finally, even if UWB devices were to be subject to the band restrictions set forth in Section 15.209(a), Kyma has justified the need for such a waiver of such requirement by demonstrating in its Waiver Request that: (i) operations in the relevant spectrum are necessary for the uCor to provide more precise measurements (which is clearly in the public interest); and (ii) the uCor Device will not cause harmful interference or safety risks to other spectrum users.[18]

Conclusion. The commenters in this proceeding generally support Kyma's Waiver Request. There is a consensus that the uCor Device will serve an important public interest while posing an insignificant threat of interference risk to other spectrum users. Based on foregoing discussion and the information contained in the docket for this proceeding, Kyma respectfully requests that the Commission grant the Waiver Request.

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[16] 2002 UWB Order at ¶ 5. The Commission stated the same thing with respect to other Part 15 UWB devices including wall imaging systems and through-wall imaging systems. *Id.*
[17] The Section 15.209(a) footnote restricts fundamental emissions in four bands totaling 408 MHz of spectrum which constitutes 42.5% of the spectrum below 960 MHz.
[18] *See, e.g.*, Waiver Request at 8 and 28.

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CERTIFICATE OF SERVICE

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